

Before Waikato District Council Hearings Commissioners

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER Variation 3 to the Proposed Waikato District Plan

**STATEMENT OF EVIDENCE OF JUSTIN WILLIAM ADAMSON ON BEHALF OF
HOROTIU FARMS LIMITED (SUBMITTER 049)**

Dated 07 NOVEMBER 2023

1. QUALIFICATIONS AND EXPERIENCE

1.1 My full name is Justin William Adamson.

1.2 I am a Civil Engineer specialising in Land Development and Stormwater Management employed by Fraser Thomas New Zealand Ltd as a Principal Civil Engineer and Tauranga Branch Manager.

1.3 My qualifications are BE (Civil)(hons) from the University of Canterbury (2006). I am a Member of Engineering NZ (256609).

1.4 I have worked in New Zealand, Australia and the United Kingdom over the past 17 years within various engineering consultancies, providing infrastructure planning and design advice for residential, commercial and industrial developments as well as large scale infrastructure projects. Over 10 years of this experience is in the New Zealand market.

1.5 My experience includes:

- a) Design of residential, commercial and industrial development infrastructure, including bulk earthworks, roading, drainage (wastewater and stormwater management), water supply and utilities; and
- b) Project or civil/utility design lead and Construction monitoring oversight on numerous projects including Streetscapes Projects in downtown Auckland for City Rail Link and Downtown Infrastructure Development Project, Te Awa Lakes Master Planning and Stage One Subdivision, West Dunes residential development, Tauranga Crossing Stage 2 and 3 Civil Works, Western Australia Iron Ore Projects, Yagan Square Redevelopment and the Square Kilometre Array.

1.6 I have previously worked for Aurecon New Zealand Limited (New Zealand), Aurecon Australia Limited (Australia) and Mott McDonald (United Kingdom).

1.7 Whilst working for my previous employer Aurecon New Zealand Limited, I was involved with the Te Awa Lakes Project including the Horotiu East North block, Horotiu West Block and the Horotiu East South Block. I was involved with the project for approximately 3 years and during that time was responsible for developing the Integrated Catchment Management Plan for the Horotiu East North site which includes a part of the Horotiu West site, managing the consent design and detailed design for Stage One of the Horotiu East North site, oversight of the construction monitoring on the Horotiu East North Site and was the Project Manager for Aurecon New Zealand Limited as the lead engineering consultant for the Te

Awa Lakes Project.

- 1.8 My evidence addresses the civil servicing of the Horotiu West block of land proposed to be rezoned to medium density residential under Proposed Variation 3 to the Proposed Waikato District Plan. I have had limited input in the current process in relation to Variation 3.
- 1.9 I confirm that I have read and agree to comply with the Code of Conduct for Expert Witnesses set out in the Environment Court's Practice Note 2023. Except where I state that I am relying on the evidence of another person, this written evidence is within my area of expertise.

2. SCOPE OF MY EVIDENCE

- 2.1 My evidence addresses the following:
- a) Background
 - b) Wastewater Servicing
 - c) Water Supply and Servicing
 - d) Stormwater Management
 - e) Submissions and Evidence Review
 - f) Conclusion

3. BACKGROUND

- 3.1 The approximate extents of the Horotiu West block of land are shown in Figure 1 below and are generally bordered by State Highway 1 to the east, Great South Road to the South, existing properties and Horotiu Bridge Road to the east and the Waikato River to the north. It should be noted that the land parcels shown on Figure 1 also include a large portion of the Waikato Expressway.

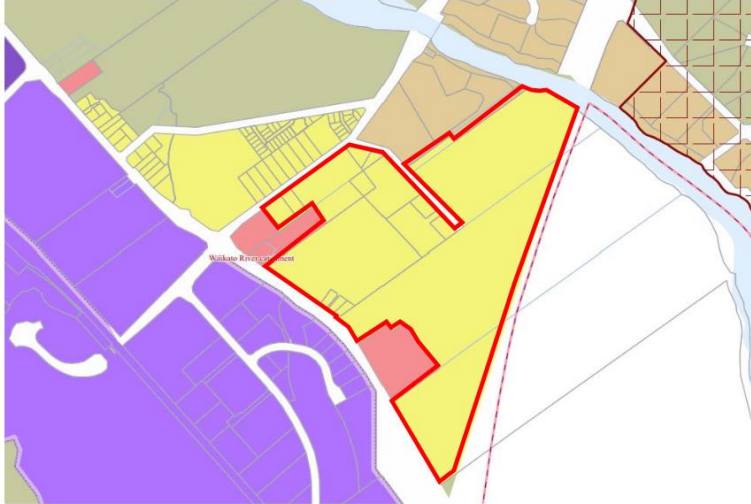


Figure 1: Land subject to HFL rezoning submission shown in red outline (the Horotiu West Land)

Figure 1: Proposed area of Horotiu West subject to rezoning. Sourced from the Section 42A report dated 15th September 2023.

- 3.2 The Horotiu West block of land has 3 distinct areas that will be referred to throughout my evidence. These are shown on Figure 2 below.
- a) Horotiu West – Te Awa Lakes Block – This block forms part of the overall Te Awa Lakes master planned development.
 - b) Horotiu West – Korris Block – This block of land is on a separate title and an application for subdivision and land use consent is currently going through a resource consent process.
 - c) Horotiu West – School and Kernot Rd Block – This is the balance of the land which includes Horotiu School, Horotiu Playcentre and existing properties alongside Horotiu Bridge Road and Kernot Road

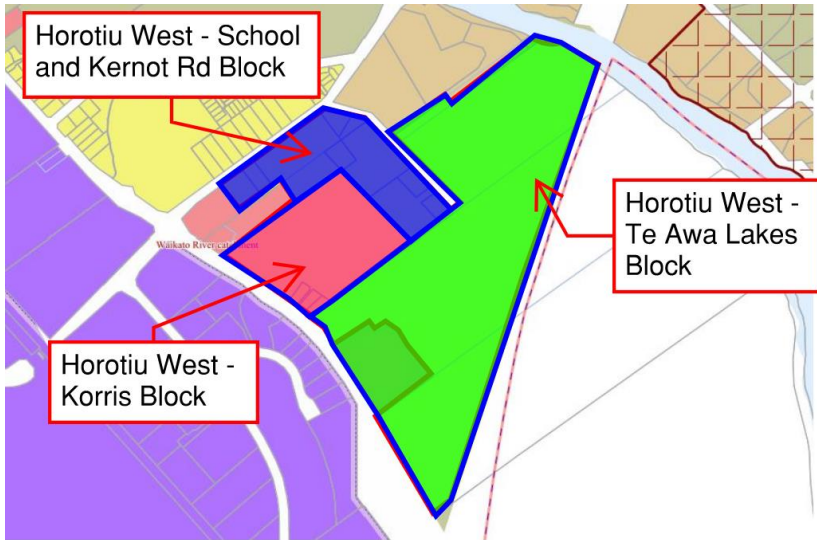


Figure 2: Horotiu West Block with sub-blocks shown indicatively.

3.3 A general masterplan for the Horotiu West site was provided by Te Awa Lakes as part of the initial submission (#49) and is shown in Figure 3. I note that parts of the Masterplan shown on Figure 3 are outside of the requested rezoning submission area (Figure 1) as it is incorporated land outside of Horotiu Farms control.



- ① Transport Hub
- ② Horotiu School
- ③ Commercial Zone
- ④ Stormwater Reserve
- ⑤ Medium Density Residential Zone
- ⑥ Retirement Village
- ⑦ Wetland
- ⑧ Expressway Setback/Buffer
- ⑨ Phase 1 (HEN)



Scale 1:5000@ A3
 0 100m 250m

Figure 3: General Masterplan of the Horotiu West site showing possible uses.

3.4 A portion of the Horotiu West block of land forms part of the wider “Te Awa Lakes” master planned development at Horotiu. The overall Te Awa Lakes development site consists of Horotiu West (within Waikato District) and Horotiu East (North and South) within Hamilton City. The combined Te Awa Lakes area is shown in Figure 4 below.

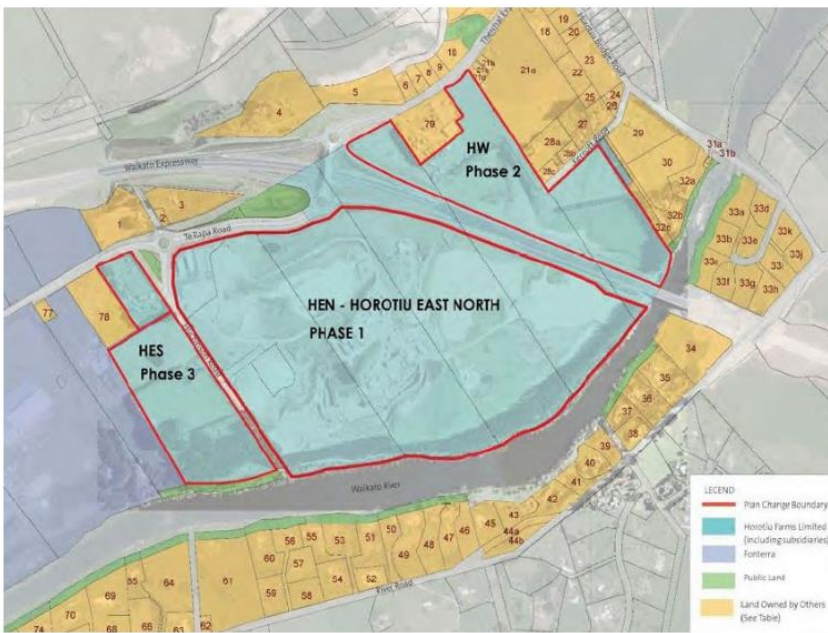


Figure 4: Te Awa Lakes site with Horotiu West (HW), Horotiu East North (HEN) and Horotiu East South (HES)

3.5 To understand the wastewater and water demands on the site, an understanding of the expected density and population equivalent is important. I have undertaken a high-level assessment of the site using two scenarios and the Regional Infrastructure Technical Standards (RITS). The area assumed for population equivalent calculations are the approximate areas inside within the proposed rezoning submission. The areas do not include the State Highway setback buffer or stormwater management areas. The population equivalents are as per Table 5-3 of the RITS and have assumed 120 persons / ha as per Residential Intensification Zone.

Scenario	Area	Population Equivalent
A - Zoning as per Masterplan (Figure 3)	25.5ha	2,236
B - Entire area as Residential Intensification Zone	25.5ha	3,060

3.6 The Horotiu west – Te Awa Lakes block team have been working on a number of concept masterplans that are targeting approximately 50 dwellings/ha, this is approximately the same as the RITS Residential Intensification allowance of 120 persons / ha and works out at approximately 2.4 people / dwelling.

3.7 Due to a number of constraints of the site, particularly stormwater management area requirements and separation from the highway, I don't believe it would be likely that the entire Horotiu West block will achieve the 50 dwellings/ha across the entire site. In my opinion and experience an average of 30-35 dwellings/ha would be more likely. This gives a similar population equivalent of Scenario A above. I have considered Scenario B a probable maximum development population to base some servicing assumptions and comparisons around later in my evidence.

4. WASTEWATER SERVICING

4.1 I have reviewed the Waikato District Council GIS system, and the following existing wastewater infrastructure is in proximity to the Horotiu West site.

- a) An existing 225mm dia. Pipe has been laid to the corner of Horotiu Bridge Road and Great South Road. It has been noted on the GIS system that this pipe is a *"Rising main for future use, laid to Great South Road and then capped"*.
- b) Existing Gravity network in Washer Road servicing a recently completed development on the corner of washer road and Horotiu Bridge Road

4.2 I have undertaken a site visit on the 18th of October 2023 and did not note any additional wastewater infrastructure in close proximity to the site during my visual inspection.

4.3 There have been a number of reports and studies that have been undertaken looking at the wastewater servicing for the Horotiu West Block. These include an AECOM report *"Horotiu West Development – Three Waters Infrastructure Assessments 13-Mar-2018"* and Beca Report *"Ngaaruawaahia Structure Plan - Water & Wastewater Technical Assessment, 2 March 2023."* of which the Horotiu West Block is noted as a growth cell.

4.4 I have reviewed the AECOM report and note the following key points:

- a) Constraints in the existing Horotiu and Ngaaruawaahia system were noted.
- b) WDC at the time were in the process of planning a new major pump station that would pump direct to the Ngaaruawaahia WWTP.
- c) Servicing of the Horotiu West block was proposed by pump station that would pump to

the new major pump station which will ultimately discharge into the WWTP.

- d) Recommended considering the impacts of the Horotiu West Block on the proposed pump station and rising main as well as the wider wastewater network and treatment plant.
- e) The assessment used a 17-hectare site, 285 dwellings and a population of 770 people (approx. 45 persons/ha). T
- f) This resulted in average daily flow estimate of 2.24 L/s, peak wet weather flow of 9.2 L/s and a minimum recommended pumped rate of 10 L/s.

4.5 I have reviewed the BECA report and note the following key points:

- a) Constraints in the existing system were noted particularly existing pump stations.
- b) A new Pump Station is being planned in Horotiu that will ultimately service the Horotiu township.
- c) Wastewater infrastructure upgrades were being undertaken to the network at the Ngaaruawaahia Bridge to accommodate additional flows to the Ngaaruawaahia WWTP.
- d) Population growth within Horotiu to increase from 1309 people to 6548 people by 2051.
- e) Average daily wastewater flow demands to increase from 196m³/day to 1244m³/day in 2051.
- f) It is unclear exactly where in Horotiu the growth is expected, however only 2 growth cells are identified within the report being an industrial area on the south of the railway line and the Kernot Road area (Horotiu West).

4.6 Using the areas and population equivalents stated in Scenario A and the Regional Infrastructure Technical Specification (RITS) the following wastewater flow are expected from the Horotiu West block:

- a) Average daily flow of approximately 5.8L/s (501m³/day)
- b) Peak wet weather flow rate of approximately 20.4L/s

4.7 Using the areas and population equivalents stated in Scenario B and the Regional Infrastructure Technical Specification (RITS) the following wastewater flow are expected from the Horotiu West block.

- a) Average daily flow of approximately 7.7L/s (667m³/day)
- b) Peak wet weather flow rate of approximately 25L/s

4.8 External Servicing

4.9 As described in the SECTION 32AA REPORT, there are a number of limitations in the capacity of the existing wastewater network. These have been identified within the BECA report and the following upgrades required to cater for expected population growth:

- a) New Pump station at Horotiu with a second pump station underway
- b) New gravity sewer and lift pump station
- c) Wastewater from Horotiu will eventually be diverted to the Pukete WWTP requiring a new transfer pump station and rising mains.
- d) The report also It also notes *There may be an option to divert flows from Horotiu to the Hamilton City network in the future.*

4.10 Even at the probable maximum development (Scenario B), the population equivalent and additional wastewater flows are within the assumed parameters under the BECA report and modelling. Therefore, I don't foresee any issues with external wastewater servicing for the site. The timing of the development of the site compared to wider network upgrades will need to be worked through with Watercare and WDC.

4.11 Internal Servicing

4.12 Existing contours and landform of the site indicate that the site should be able to be serviced by traditional gravity systems to a single pump station, near the low point of the site adjacent to the State Highway. However, dependant on the timing of developments within the Horotiu West block by different landowners, several pump stations or temporary pumps stations may need to be installed until the full catchment is developed. The system will need to be designed and constructed to WDC standards and I don't foresee any issues with this.

4.13 I have reviewed the wastewater drawings for the Korris Block development that have been submitted for Consent. It is proposed that a new gravity network, wastewater pump station and rising main is constructed to service the development. It is proposed to connect the rising main through the Horotiu West – School and Kernot Road block and into a receiving discharge manhole in Horotiu Bridge Road. The exact location is unclear from the drawings.

4.14 I haven't undertaken a detailed analysis of the Korris Block development wastewater system, but from my experience, the proposed layout and configuration including pipe sizing appears sufficient to service the 57-lot development. If the Korris Block wanted to increase its density and hence populations, the wastewater servicing for this block of land would need to be revisited by the designer.

4.15 I am satisfied that the Horotiu West block of land can be reticulated within the site. From my review of the BECA report, it appears that the site can be externally serviced by upgrades to the existing wastewater network. These particular upgrades and timing of these in relation to the development of the Horotiu West block will need to be worked through with WDC, Watercare and the developers of the Horotiu West block.

5. WATER RETICULATION

- 5.1 I have reviewed the Waikato District Council GIS system, and the following existing water supply infrastructure is in proximity to the Horotiu West site.
- a) An existing 150mm dia. water main runs along the western side of Horotiu Bridge Road
 - b) An existing 63mm dia. Rider main runs along the majority of the eastern side of Horotiu Bridge Road
 - c) An existing 63mm dia. Rider main is located on the southern side of Kernot Road
 - d) An existing 63mm dia. Rider main is located on the northern side of Great South Road / Thermal Explorer Highway that terminates at approximately 6265 Great South Road.
- 5.2 I undertook a site visit on the 18th of October 2023 and did not note any other water supply infrastructure not included in the GIS system.
- 5.3 There have been a number of reports and studies that have been undertaken looking at the wastewater servicing for the Horotiu West Block. These include an AECOM report "*Horotiu West Development – Three Waters Infrastructure Assessments 13-Mar-2018*" and Beca Report "*Ngaaruawaahia Structure Plan - Water & Wastewater Technical Assessment, 2 March 2023.*" of which the Horotiu West Block is noted as a growth cell.
- 5.4 I have reviewed the AECOM report and note the following key points:
- a) The pipe sizing nearby the Horotiu West development was not sufficient to service the development and that the 150mm main from Horotiu Bridge Road would need to be extended and looped into the site (pending detailed modelling)
 - b) Recommended testing the additional flows from the Horotiu West Block on the WDC water network to determine level of service.
 - c) The assessment used a 17-hectare site, 285 dwellings and a population of 770 people (approx. 45 persons/ha). T
 - d) This resulted in average daily flow estimate of 2.3 L/s and a peak flow of 11.6 L/s (not including fire flows)
- 5.5 I have reviewed the BECA report and note the following key points:
- a) A population growth model was built using 2.8 people per dwelling and 220L/person/day. I note that this is lower than the RITS which uses 260L/person/day.
 - b) Population growth within Ngaaruawaahia/Horotiu to increase from 8348 people to 12359 people by 2050.
 - c) Peak daily water demands to increase from 4010m³/day to 6550m³/day in 2050 in the Ngaaruawaahia / Horotiu zone.

- d) It is unclear exactly where the growth is expected.
 - e) The network performs well under existing and future demand, with some minor issues identified in the modelling.
- 5.6 Using the areas and population equivalents stated in Scenario A and the Regional Infrastructure Technical Specification (RITS) the following water supply flowrates have been calculated from the Horotiu West block.
- a) Average daily flow of approximately 6.7 L/s (581m³/day)
 - b) Peak flow rate of approximately 33.6 L/s (not including fire flows)
- 5.7 Using the areas and population equivalents stated in Scenario B and the Regional Infrastructure Technical Specification (RITS) the following wastewater flow are expected from the Horotiu West block.
- a) Average daily flow of approximately 9.2 L/s (800m³/day)
 - b) Peak flow rate of approximately 46.0 L/s (not including fire flows).
- 5.8 External Servicing
- 5.9 As described in the SECTION 32AA REPORT, there are a number of limitations in the capacity of the existing water network. These have been identified within the BECA report and the following upgrades were recommended to cater for expected population growth:
- a) Improve treatment capacity at the WTP.
 - b) Pipework upgrades to meet level of service.
 - c) Reservoir storage upgrade.
- 5.10 Even at the probable maximum development (Scenario B), the population equivalent and additional water demands are within the assumed parameters under the BECA report and modelling, however, would account for approximately 75% of the growth of the Ngaaruwaahia / Horotiu area (population equivalent). The timing of the development of the site compared to wider network upgrades will need to be worked through with Watercare and WDC.
- 5.11 The RITS states also states *that to protect level of service of new subdivisions, no more than 150 residential Lots shall be serviced, at any point from a single ended 150mm diameter watermain (unless water modelling proves that DN100 will be sufficient, but then no more than 40 residential lots). Connectivity of the water network is to be confirmed prior to further lots being brought forward for 224(c) release.* Therefore, I would suspect that the existing 150mm water main within Horotiu Bridge Road would have insufficient capacity for the entire development and may be near capacity now. This would need to be confirmed with

Watercare or WDC

5.12 Internal Servicing

5.13 Major changes in elevation high points can result in pressure loss and inadequate pressure supply but I don't foresee there being any major changes in elevation high points as the block gets developed. I am unaware of any issues with the water supply to the sites current high point (Horotiu School).

5.14 I have reviewed the water supply drawings for the Korris Block development that have been submitted for Consent. It is proposed that a new 150mm uPVC water main is connected to the existing 150mm uPVC main in Horotiu Bridge Road and extended to the site to service the development. It is proposed to internally reticulate the site with the 150mm uPVC main and a series of rider mains.

5.15 I haven't undertaken a detailed analysis of the Korris Block development water supply system, but from my experience, the proposed layout and configuration including pipe sizing appears sufficient to service the 57-lot development. If the Korris Block wanted to increase its density and hence populations, the servicing for this block of land would need to be revisited by the designer.

The RITS states also states that *to protect level of service of new subdivisions, no more than 150 residential Lots shall be serviced, at any point from a single ended 150mm diameter watermain (unless water modelling proves that DN100 will be sufficient, but then no more than 40 residential lots). Connectivity of the water network is to be confirmed prior to further lots being brought forward for 224(c) release.* As I have alluded to above, the existing Horotiu Bridge Road 150mm pipe may be at or near capacity and any further lots added may require wider upgrades.

5.16 As the development of the block of the land occurs, capacity within the water supply network for firefighting flows will need to be ensured to meet the Development Code and the NZ Fire Service Firefighting Water Supplies Code of Practice (SNZ PAS 4509:2008).

5.17 Internal lots would install appropriate connections at the time of development.

5.18 I am satisfied that the Horotiu West block of land can be reticulated within the site. From my review of the BECA report, it appears that the site can be externally serviced by upgrades to the existing water network. These particular upgrades and timing of these in relation to the development of the Horotiu West block will need to be worked through with WDC,

Watercare and the developers of the Horotiu West block.

6. STORMWATER MANAGEMENT

- 6.1 The Horotiu West site is split into several subcatchments that generally align with the blocks shown in Figure 2. Characteristics of the Horotiu West block of land are:
- a) The Horotiu School is a high point in the catchment.
 - b) The Horotiu West – Te Awa Lakes Block - Generally falls towards low lying areas adjacent to Stage Highway 1. At present the stormwater from parts of the State Highway drainage system discharge into the Horotiu West site and contributes to the catchment. There is an existing culvert under the State Highway that hydraulically connects to the Te Awa Lakes Horotiu East North Block.
 - c) The Horotiu West – Korris Block generally falls towards the Te Rapa stream at the western side of the site. This catchment has a significant upstream catchment that is piped under Great South Road to the site.
 - d) The Horotiu West – School and Kernot Road block is relatively flat through the school site. There is a localised low point approximately halfway down Kernot Road that the adjacent properties fall towards this low spot. The properties on the western side of the school fall towards the west and towards the Te Rapa stream.
- 6.2 I have reviewed the Waikato District Council GIS system and note that there is no stormwater infrastructure shown in close proximity to the Horotiu West site.
- 6.3 I undertook a site visit on the 18th of October 2023 and noted that there is a quite a lot of stormwater infrastructure in close proximity to the Horotiu West Site This includes:
- a) Culverts under Great South Road for the unnamed stream
 - b) Informal swales drain on Great South Road.
 - c) Sumps at the corner of Horotiu Bridge Road and Kernott Road
- 6.4 Due to proposed development within the various blocks of land there has been a significant amount of work undertaken to understand appropriate stormwater management practices within each block. A summary of these is prescribed below:
- 6.5 Horotiu West – Te Awa Lakes – This block of land is included within the Te Awa Lakes Integrated Catchment Management Plan and an application by Aurecon has been lodged with the Waikato Regional Council for the stormwater management and permanent stormwater discharge (CSC) for the Te Awa Lakes wider site which includes this block of land.
- 6.6 During my time with my previous employer Aurecon, I was involved with the stormwater design and authoring of the Sub-catchment integrated management plan for the Te Awa

Lakes site of which the Horotiu West – Te Awa Lakes Block is a part thereof.

- 6.7 I understand that this application has yet to be granted as the final Section 92 items are being worked through with the Regional Council and that these relate to matters including the ecological rehabilitation plan (ERP) and fish passage in the existing gully to the south of the Horotiu East North site.
- 6.8 I have reviewed the *“Piped Outlet Structure and Permanent Stormwater Discharge Resource Consent Application - Assessment of Effects on the Environment - Te Awa Lakes Unincorporated Joint Venture Reference: P510586-005 Revision: 2 2022-12-05”* as well as the associated appendices and in particular Appendix B - Sub-Catchment Integrated Catchment Management Plan (*Te Awa Lakes Sub-Catchment Integrated Catchment Management Plan - Perry Group Limited - Reference: 510586 -Revision: 3, 2021-03-04*) and Appendix J – Permanent Stormwater Discharge Report (*Te Awa Lakes Permanent Stormwater Discharge Report - Te Awa Lakes Unincorporated Joint Venture - Reference: 510586 - Revision: 1, 2022-11-25*)
- 6.9 The Horotiu West – Te Awa Lakes Block currently has a number of low-lying areas that pond water before soaking away during rainfall events. There is also an existing 1050mm diameter culvert that links the Horotiu West site to the Horotiu East North Te Awa Lakes development site. This existing culvert appears to have been installed around 2012 when the State Highway was constructed. It appears that the culvert is used to drain the Horotiu West – Te Awa Lakes Block to Te Awa Lakes Horotiu East North block lakes, however it may also be a pipe to balance water between the two sites also. It is noted in the Permanent Stormwater Discharge Report: *“The Horotiu West catchment (catchment 6) is intended for residential development and is hydraulically connected to the Te Awa Lake by an existing 1050mm dia culvert installed under the Mangaharakeke Drive embankment. This culvert is at a level that would be permanently drowned at both ends by the proposed Te Awa Lake level. While this does not necessarily affect its theoretical capacity, the chance of unseen blockages increases. Also, previous work by CKL to support the plan change for the Te Awa Lakes development show that the peak 100yr ARI runoff from this catchment is greater than the culvert capacity and therefore the 100yr ARI flood level upstream is higher than the main Te Awa Lakes site. The finished ground levels for this block are yet to be designed and the final combination of minimum building platform / storage area / and culvert capacity will be determined at this detailed design stage. For this reason, the main site high flow outlet has been designed based on no additional attenuation of the flow contribution from the Horotiu West site, over and above the attenuation that occurs within the main HEN lake.”*
- 6.10 As noted in the Aurecon Permanent Stormwater Discharge Report, at present, there are

several discharge locations along the State Highway which discharge stormwater from the State Highway into the Horotiu West and Horotiu East North blocks of the Te Awa Lakes site. The management of this stormwater is currently being worked through with the developer and Waka Kotahi and it has been confirmed that the State Highway runoff will be managed in a completely separate system.

6.11 The Aurecon Te Awa Lakes Sub-Catchment Integrated Catchment Management Plan describes the stormwater management for the Horotiu West – Te Awa Lakes Block.

6.12 The Te Awa Lakes Sub-Catchment Integrated Catchment Management Plan is unique in that one of the primary aims of the Plan is to achieve and maintain a contact recreational water quality level within the proposed Te Awa Lakes on the Te Awa Lakes Horotiu East North site. To achieve this, it is proposed to capture and treat stormwater runoff from within the catchment and direct it to the proposed lakes.

6.13 The key elements of Stormwater management for the Horotiu West – Te Awa Lakes Block are:

- a) A treatment train approach is proposed to achieve water quality targets including:
 - i. Inert building materials to be used.
 - ii. At-source Low Impact Design treatment devices (bioretention devices for road and multi-lot internal development accesses and parking areas)
 - iii. Centralised wetlands
 - iv. Dedicated Lake management plan
- b) Overland flow paths within road reserves
- c) Minimum freeboard requirements as per RITS
- d) Treated and attenuated stormwater from the Horotiu West – Te Awa Lakes Block is still proposed to be piped under the State Highway directly into the proposed Te Awa Lakes. The design of this pipe and associated inlets and outlets as well as any attenuation design, ponding levels and freeboard requirements will need to be carefully considered during the design phase of the development. The permanent design water level within the Te Awa Lakes will also need to be considered for peak flow discharges from the Horotiu West site as this will present a tailwater condition.
- e) The proposed Te Awa Lakes will provide a degree of extended detention prior to eventual discharge to the Waikato River
- f) An emergency overflow for overdesign events i.e., events greater than 1% AEP located at the northern extent of the site.

- 6.14 Due to the proximity to the Waikato River, there is also a risk of flooding from the Waikato River. Design ground levels including freeboard will need to be cognisant of the Waikato River flood levels and ensure the Waikato River cannot flood into the site through overland flow, backflow and/or seepage. The Integrated Catchment Management Plan states draft levels received from the Waikato Regional Council adjacent to the Horotiu East North site of RL 16.13m (Moturiki Datum) for the 1%AEP event including RCP 8.0 climate change predictions. From a review of the LIDAR information for the Horotiu West – Te Awa Lakes Block sourced from Hamilton City Council GIS system; it appears that there are potentially areas of the site adjacent to the Waikato River that are lower than RL 16.13. This will need to be addressed and checked as part of the design phase.
- 6.15 It is currently proposed that the Te Awa Lakes resident's society will own and maintain the proposed Te Awa Lakes and wetlands. Therefore, these will be privately owned. The ownership and maintenance of the Wetlands and bioretention devices will need to be considered by Waikato District Council. As the treatment train approach to stormwater management for the site relies on every part of the train being maintained and operated as designed, the water quality within the proposed lakes could be impacted by lack of maintenance.
- 6.16 From the preliminary assessment of wetland sizing, it appears that sufficient allowance has been left in the Master plan to accommodate the wetland within the Horotiu West – Te Awa Lake Block.
- 6.17 The management of stormwater on the Horotiu West – Te Awa lakes block will need to be in accordance with the approved permanent stormwater discharge consent. At the time of writing this evidence this consent was not approved so I haven't been able to review any conditions applicable to the site.
- 6.18 In conclusion, I am satisfied that the stormwater management has been analysed and appropriately described in the application to show that stormwater can be managed on the Horotiu West – Te Awa Lakes site, however the exact details are to be determined through the more detailed, development specific design that would be provided to gain subdivision and land use consent.
- 6.19 Horotiu West – Korris Block – The stormwater management for this block of land is described in the *Te Miro Water Stormwater Management Plan 2023 6257 Great North Road Horotiu 03/08/2023* and an application by the landowner has been lodged for subdivision and landuse consent. I understand that this application has yet to be granted as there are a few

Sections 92's being worked through with the applicant and the Authorities.

6.20 I have reviewed the *Te Miro Water Stormwater Management Plan 2023 6257 Great North Road Horotiu 03/08/2023* as well as the stormwater drawings for the Korris Block that were submitted for consent. The key elements of the stormwater management for the site are:

- a) Centralised wetland for treatment with Extended detention Volume (EDV)
- b) On lot soakage
- c) Enhancement of the existing unnamed stream through the site for erosion mitigation.
- d) Mitigation of flood plain infilling with compensatory cut areas
- e) Existing stream through the site has a large upstream catchment area.

6.21 The management of stormwater on the Horotiu West – Korris block will need to be in accordance with the approved consent. At the time of writing this evidence this consent was not approved so I haven't been able to review any conditions applicable to the site or final design amendments to satisfy Council requirements.

6.22 In summary, the stormwater management has been analysed and described in the application to show that stormwater can be managed on the Horotiu West – Korris Block.

6.23 Horotiu West – School and Kernot Road – The stormwater management for this block of land is governed by the Waikato district Council Catchment Management Plan Ngaaruwaahia & Surrounds Structure Plan Area Tonkin and Taylor 2015 and the Horotiu Comprehensive Stormwater Discharge Consent.

6.24 I have reviewed the Waikato district Council Catchment Management Plan Ngaaruwaahia & Surrounds Structure Plan Area Tonkin and Taylor 2015 and confirm that this block of land is covered by the plan.

6.25 The management of stormwater on the Horotiu West School and Kernot Road block will need to be in accordance with the approved comprehensive stormwater consent for Horotiu. The exact details are to be determined through the more detailed, development specific design the would be provided to gain subdivision and land use consent.

7. SUBMISSIONS AND EVIDENCE REVIEW

7.1 I have read a number of submissions and statements of evidence on Variation 3. Below I respond to the specific submissions and evidence raising water supply, stormwater or wastewater concerns related to the Horotiu West Block of land.

7.2 Further Submission 201 – Korris Limited

7.3 Korris Limited have submitted on the proposal in support of Horotiu West Block of land being rezoned to medium density residential. Korris have requested that the piece of land located at 6257 Great North Road be included in the rezoning also. This area is included in the master plan area shown in Figure 2. Within the Korris submission, it is stated that this block of land legally described as Part Lot 5 DPS 5176 can be comprehensively serviced by the Councils three waters. This is further backed up by the application for subdivision. This specific site has been commented on in my evidence above.

7.4 I have reviewed the Statement of evidence of Mr. Andrew Boldero (of Te Miro Waters Ltd TMW) Dated 20 June 2023 as well as 26th September 2023 and have noted the following:

7.5 Mr Boldero recommends that Variation 3 avoids all developments within modelled high-risk areas and for consent to be required for development or subdivisions in all other areas within the floodplains. I have reviewed the flood risk maps by Te Miro Water and walked over the Horotiu West site. The locations shown as high-risk flood areas within the Horotiu West site are typically greenfield sites and are existing trapped low-lying areas within paddocks that have no drainage infrastructure or overland flowpaths to drain the area (i.e., holes). The exception to this is the area within the Korris Block and the neighbouring car parts yard adjacent to the Te Rapa Stream which drains via the stream. I have also observed several of these areas with ponded water after rainfall events. When development of these greenfield sites on Horotiu West is undertaken it is likely that significant earthworks will be undertaken, and drainage infrastructure will be installed to relieve some of these trapped low points. Therefore, I would recommend that a management approach is more appropriate than an avoidance approach which is more aimed towards brownfield developments. With appropriate management practices for earthworks and stormwater as well as consents, the development of these areas to manage stormwater and avoid flooding risk can be achieved.

7.6 I support Mr Boldero's view that development within overland flowpaths and flood plains require a consent and further assessment of effects of developing within a floodplain and overland flowpaths. However, I would recommend the this be further rationalised to define exactly what qualifies as a flood plain (volume and / or depth of water) and an overland flow path (depth of water or flowrate).

7.7 I agree with Mr Boldero's comments around the high-risk flood area definition and reducing this to a value of less than one.

7.8 I agree with Mr Boldero's recommendations around regular updates to flood hazard maps.

- 7.9 I have also reviewed the updated flood hazard maps provided by Te Miro water and associated flood modelling report (*VARIATION 3 FLOOD MAPS HOROTIU UPDATED MAPS - FINAL (NOVEMBER 2023)*) and have the following comments.
- 7.10 As there is very little drainage infrastructure in the area, the modelled flood areas appear to align with the trapped low-lying areas (i.e., holes) in the topography which would be expected. During large rainfall events and during 2021, 2022 and 2023, I was visiting the Horotiu East North site regularly and noted ponded areas within the Horotiu West – Te Awa lakes block that were around for a few days/weeks following rainfall events. In particular alongside the State Highway and these generally aligned with the areas shown on the flood maps.
- 7.11 It appears that no calibration of the model has been undertaken so reliance on the flood maps needs to be exercised with caution.
- 7.12 80% impervious area used for residential growth cells including roads – MDZ2 allows up to 70%. I would therefore consider the modelling maybe conservative to some degree and potentially overestimating flooding and runoff.
- 7.13 Mr Boldero noted in his earlier evidence that a high-risk flood area is one where the depth multiplied by the velocity is greater than one. However, on the flood hazard maps, with the Horotiu West site there are a number of the trapped low points in the paddocks that are identified as high risk. Typically, these areas are relatively flat areas and localised catchments that create large puddles in the holes. These puddles would have low/no velocity so I would not expect these to have triggered the requirements for High risk stated above. I would recommend that further commentary is given in the modelling report around this high-risk classification and definition as it appears that there may be a depth requirement that has triggered this high-risk classification too.
- 7.14 I Note that only a number of existing pipes were input into the flood model and these were limited to pipe sizes greater than 300mm, although I don't believe that this will have a major impact on the Horotiu West Block as there is very little drainage infrastructure on the site, it should be brought to the attention of others when relying on the accuracy of the modelling.
- 7.15 I have reviewed the SECTION 32AA REPORT and note the following:
- 7.16 Key parts of the Section 32AA Report and addendums have been noted in my evidence where they relate to water and wastewater servicing.
- 7.17 For water servicing I agree with the comments and conclusions in the report.

7.18 For wastewater servicing I agree with the comments and conclusions in the report

8. CONCLUSION

8.1 I am satisfied that the proposed Horotiu West Block can be serviced for water, wastewater and stormwater sufficient to provide for medium density residential development internally and externally with a number of network upgrades.

8.2 The potential stormwater effects of the development can be mitigated in accordance with catchment management plans and comprehensive consents that are in place.

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